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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte
WAYNE O. DUESCHER

Appeal 2009-007054
Application 10/824,107
Technology Center 1700

Decided: September 22, 2009

Before JEFFREY T. SMITH, MICHAEL P. COLAIANNI, and JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

DECISION ON APPEAL

Statement of the Case

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's decision finally rejecting claims 2-21. (Final Office Action, mailed

December 29, 2006). Claims 1 and 22-31 have been withdrawn from consideration. We have jurisdiction under 35 U.S.C. § 6(b).[1]

Appellant's invention relates to a process for making abrasive media. (Spec. 1). Claim 2 is illustrative:

> 2. A process of making spherical beads comprising:
>
> a) using a cell sheet wherein the cell sheet has a [sic] array of cell sheet through holes;
>
> b) the cell sheet through holes each have a cross sectional area;
>
> c) the cell sheet having a nominal thickness;
>
> d) the cell sheet holes form cell sheet volumes wherein a cell sheet volume is equal to the cell sheet through hole cross sectional area multiplied by the cell sheet thickness;
>
> e) mixing materials into a liquid solution, the mixture solution comprising an inorganic oxide or a combination of inorganic oxides, and water, solvents or a combination thereof;
>
> f) filling the cell sheet holes with the liquid mixture solution to form mixture volumes wherein the volume of mixture solution contained in each mixture volume is equal to the cell sheet volume;
>
> g) ejecting the liquid mixture volumes from the cell sheet by subjecting the liquid mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes from the cell sheet thereby forming independent mixture solution lump entities;
>
> h) wherein the ejecting independent liquid mixture solution lump entities are shaped into independent spherical entities by force comprising liquid mixture solution surface tension forces;
>
> i) the independent spherical entities are introduced into and subjected to a solidification environment wherein the independent spherical entities become solidified to form loose, green, spherical beads; and

[1] In rendering this decision we have considered Appellant's Brief dated October 25, 2007. An oral hearing was held on September 15, 2009.

j) firing the loose, green, spherical beads at high temperatures to produce beads.

Appellant appeals the Examiner's rejections as set forth below:

1) Claims 2, 3, 6, 8, 11, 12, 15 and 17 under 35 U.S.C § 102(b) as anticipated by Berg (5,984,988, issued November 16, 1999).[2]

2) Claims 4 and 13 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Berg and Howard (3,916,584, issued November 4, 1975).

3) Claims 5 and 14 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Berg and Eisenberg (4,393,021, issued July 12, 1983).

4) Claims 7 and 16 under 35 U.S.C. § 103 (a) as unpatentable over the combined teachings of Berg, Culler (6,521,004, issued February 18, 2003) and the Quadro Engineering Incorporated Comil® product description.

5) Claims 9 and 10 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Berg and Mathews (3,838,998, issued October 1, 1974).

6) Claim 18 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Berg and Cai (Phys Rev. Lett. 2202 Dec:89(23):235501).

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[2] In support of this rejection the Examiner also cited Zhai et. al., *"Influence of rheological behavior of aqueous $A1_2O_3$lNano-TiO_2 slurry on the characteristics of powders prepared by spray pelletization"*, Materials Science and Engineering A 392 (2005) pp. 1-7.

7) Claims 19 and 20 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Berg and Culler.

8) Claim 21 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Berg and Ramanath (5,834,569, issued November 10, 1998).

The dispositive issue before us is whether the Examiner has established that Berg describes ejecting liquid mixture from a cell sheet by subjecting the liquid mixture solution to an impinging jet of fluid, wherein the liquid mixture solution are shaped into independent spherical entities by force comprising liquid mixture solution surface tension forces as recited in independent claims 2 and 11. We answer this question in the negative. Therefore, WE REVERSE.[3]

The Examiner bears the initial burden of presenting a prima facie case of anticipation or obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). In order to establish a prima facie case of obviousness, the Examiner must show that each and every limitation of the claim is described or suggested by the prior art or would have been obvious based on the knowledge of those of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988)). "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (quoted with approval in *KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 418 (2007).

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[3] We select claims 2 and 11 as representative of the rejected subject matter.

The Examiner found that Berg teaches a method of manufacturing abrasive particles having predetermined shapes. The Examiner (Ans. 19-20) summarized the rejection on appeal as follows:

> Since the teachings of Berg (US 5,984,988) as evidenced by Zhai et. al. is [sic] central to each of the contested art rejections, the key findings set forth by Berg and the resulting basis for the art rejection of claims under 35 U.S.C. 102(b) are here summarized. In short, Berg teaches;
>
> 1) A mold or cell sheet having an array of through holes and each hole having a cross sectional area and a "nominal thickness".
>
> 2) A dispersion is prepared comprising a liquid solution of inorganic oxides and water to prepare a liquid solution.
>
> 3) The array of through holes is filled with the liquid solution to form entrained mixture volumes.
>
> 4) A portion of the liquid is evaporated from the entrained dispersion, however even in the most extreme scenario presented by Berg the mixture volumes still contain approximately 30% water by weight. Since liquid water was initially added to the inorganic powder to form the mixture volumes, said mixture volumes would be rightfully construed as "liquid mixture volumes". Similarly, since water remains in the mixture volumes after this partial dehydration step, the partially dehydrated mixture volumes are likewise considered, in the broadest reasonable interpretation of the term, to be "liquid mixture volumes".
>
> 5) These liquid mixture volumes are ejected from the cell sheet by application of a pressure or an "impinging jet".
>
> 6) Berg discloses that after ejection "some of the edges may become rounded". In the absence of any compelling evidence to the contrary, it is the Examiners position that this rounding effect occurs at least in part due to surface tension forces. In combination with the Berg teaching of truncated spherical or truncated spherical geometries for the particles, the Berg process is understood to provide for ejected, independent liquid mixture

solution entities having a spherical shape which are subject to surface tension forces.

7) The entities are dried outside of the mold or equivalently subjected to a solidification environment.

8) The dried entities are ultimately subjected to a sintering process to produce sintered beads.

The reference to Zhai is pointed to in this rejection simply to provide supporting evidence that high solids (e.g. up to 70% by mass alumina in water) content slurries of very closely related, albeit not identical composition, are subject to deformation by surface tension forces. Restated, the rejection as presented does not turn upon the disclosure provided by Zhai, however, said reference does provide further supporting evidence for the action of surface tension upon the ejected "liquid mixture volumes".

Appellant contends, and we agree, that the dispersion of Berg is dried (solidified) prior to removal from the mold cavity. Specifically Appellants states "[t]he product of Berg that is dried to at most 30% water is more than just dried [it] is required to be gelled by the process before expulsion from the mold." (Br. 15). Appellant also asserts that Berg, column 7, discloses the dispersion is solidified prior to removal from the mold cavity. Berg, column 7 lines 1-45 is reproduced below:

The fourth step of the process of this invention involves removing a portion of the liquid, i.e. the volatile component thereof, from the dispersion while the dispersion is in the mold cavity, thereby resulting in an increase in the viscosity of the dispersion. It is preferred that the volatile component be removed by evaporation rather than by an external force such as filtration. Removal of liquid by evaporation can occur at room temperature or at elevated temperatures. The elevated temperatures can range from about 40° C. to about 300° C. However, at higher temperatures, high drying rates are obtained that produce undesirable cracks in the resulting abrasive particle. It is preferred to heat the mold containing the

dispersion at a temperature of from about 50°C. to about 80° C. for from about 10 to about 30 minutes in a forced air oven. A sufficient amount of the volatile component must be removed from the dispersion to bring about solidification thereof, thereby forming a precursor of an abrasive particle having approximately the same shape as the shape of the mold cavity. It is preferred that a sufficient amount of volatile component be removed from the dispersion so that the precursors of the abrasive particles can be easily removed from the cavities of the mold. Typically, up to 40% of the liquid is removed from the dispersion in this step. At this point the precursors of the abrasive particles are sufficiently nonsticky that they will not stick to one another when they are removed from the mold.

The fifth step of the process of this invention involves removing the precursors of the abrasive particle from the mold cavities. This step is made possible by shrinkage of the dispersion, when the liquid is removed therefrom. For example, it is not uncommon for the dispersion to shrink 20% or more. The precursors of the abrasive particles can be removed from the mold cavities either by gravity or by applying a low pressure to force them out of the cavities.

The removed precursors of the abrasive particles have approximately the same shape as the cavities of the mold from which they were formed. Exact replication is unlikely for three reasons. First, the dispersion will shrink, so the precursors of the abrasive particles will be smaller. Second, when the precursors of the abrasive particles are removed from the mold cavities, some of their edges may break off or become rounded. Third, when the dispersion is introduced in the cavities, the dispersion may not completely fill the cavities. It should be noted that care should be taken throughout the process to minimize the foregoing factors.

(Emphasis added)

The Examiner contends that Berg teaches ejecting dispersions from the cell sheet that contains an appreciable amount of the initial water content. (Ans. 6-7). While the composition of Berg may contain an amount of initial water content, the Examiner has not established that this ejected composition is a dispersion. Berg discloses an abrasive precursor is formed by removal of the volatile components from the dispersion to bring about solidification. Berg also discloses removal of the abrasive particle precursors from the mold is made possible by shrinkage of the dispersion, when the liquid is removed therefrom. As is apparent from the discussion, reproduced above, Berg discloses placing a dispersion into a mold that undergoes transformation toward solidification to form an abrasive particle precursor. The abrasive particle precursor achieves sufficient solidity to shrink within the mold cavity and retain the characteristics of the mold. As acknowledged by the Examiner, Answer 20, the abrasive particle precursor of Berg is sufficiently solid such that during ejection from the mold some of the edges of the particle precursors may become rounded. The Examiner has not established that Berg's abrasive particle precursor is the same as the liquid mixture solution required by the claimed invention. The Examiner citation to Zhai does not necessarily establish that Berg's abrasive particle precursor is the same as the liquid mixture solution required by the claimed invention.

The prior art references relied upon in the §103 rejections were not provided to address this difference between Berg and the claimed invention. Consequently, the additional cited prior art references are insufficient to establish obviousness of the claimed subject matter.

For the foregoing reasons and those presented in Appellants' Briefs, the rejections of claims 2-21 under §102 and §103 as set forth above are reversed.

ORDER

The Examiner's decision rejecting claims 2-21 is reversed.

REVERSED

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